VARNISH MAKES OR MARS A BUILDING

The Average User Is Seldom a Good Judge of Wood Preservatives.

THE SUPPLY IS LIMITED

A Substitute for Resinous Gum Has Helped Conserve It, but Is Expensive.

Varnish applied is the outward visible sign of the inward degree of building quality. Therefore it is necessary that the beauty of good wood be brought out in all its pristine splendor or its defects be safely hidden and not be made worse by ugly white scars, scratches and abrasions, the sure result of using inferior varnishes, says the *Record and Guide*.

But the average user of varnish is not equipped to differentiate between good and inferior wood preservatives, and the only test he has is to apply the varnish first and then await results. In the case of the architect, however, he of course knows the value of varnishes and in specifying them he insists upon using the varnish that positively will not check or crack or become streaky when moisture strikes it or scratch white when scraped.

The best test of a varnish, no matter what the purpose to which it is applied, is the reputation of the manufacturer as shown by the stability of his name in the trade and the number of years he has been in business. Reliability is the specifier's surest safeguard. The architect insisting upon the use of a certain brand in effect guarantees satisfactory results to his client. Therefore he must know his varnish.

Varnish applied on the interior of a home is the basis upon which the owner or occupant fixes his pride and satisfaction. If there are blemishes on those parts of his home upon which his eye constantly rests no amount of good basic, or rough construction, fireproofing, or vista will appease his disappointment and disgust. Therefore it is of prime importance that the architect and owner give thoughtful consideration to the kind of varnish he specifies.

The experience of a wealthy business man, whose name is known to almost every broker in Wall Street, is illustrative. He has just completed a palatial home in a suburban New Jersey town. In that home he put the very best wood he could find for trim. This wood was imported in some instances. In others it was brought from California, from Oregon, from South America and from Africa. A large sum of money was spent in workmanship to make the panels match in grain. Then he bought some varnish.

When this varnish dried, a mere bump of an umbrella handle against the surface of that magnificent wood was sufficient to leave a scar that was not erasable. The appearance of moisture through an open door or window changes the face of those costly panels a sickly white. A thumbnail pressure will leave a resinous streak that cannot be effaced.

The remedy? Absolutely none. It would cost as much as the repurchasing of a new ordinary hardwood trim throughout to escape those costly panels bare of varnish and apply good material, and even then the process would forever destroy the beauty of the wood.

An expert carefully studied the varnish used, followed it up even back to the very varnish kettles where it was made, and found that the failure was due to lack of personal professional supervision in its manufacture.

Which leads us to the mysterious realm of varnish manufacture, of which no dependable instruction on how to make it ever has been put on the printed page. Three times the art of making varnish has been lost, and even to this day the manufacture of varnish from amber is attended by so many fatal accidents that it has not been perfected except to the extent of producing it for exceedingly high priced violins and similar musical instruments. The ancients knew this secret, but it died with them.

Varnish is the product of a gum found in New Zealand, Africa, Batavia and Singapore, where the white damar gums come from, and a little from South America. Most of it comes from New Zealand to-day.

This gum is of a resinous nature, and here it should be stated clearly that there is a very great difference between the words "resin" and "rosin." The Century Dictionary says "resin is a hardened secretion found in many species of plants, or a substance produced by exposure of secretions to the air. It is allied to and probably is derived from a volatile oil. The typical resins are oxidized hydrocarbons, amorphous, brittle, having a vitreous fracture insoluble in water, and freely soluble in alcohol, ether and volatile oil. They unite with alkalies to form soap."

"Rosin is obtained from turpentine by distillation. In this process the oil of the turpentine comes over and the rosin remains behind. Chemically it is the anhydrid of abietic acid, and has many of the physical and chemical properties of resins." It is the product of the Georgia pine tree in this country. Rosin is the name of a very low grade of resinous gums. Rosin costs 2 cents a pound, but resinous gums cost 35 to 40 cents and up.

The resinous gum found to-day is of fossil character. Like coal, it is the product of trees which lived and passed out of existence ages before man began to tread the earth. Originally it was in the form of a sap which ran down the bark of prehistoric trees and was deposited in the sandy soil at their foot. Even now the gum is found within four feet of the surface of the earth and is sought by natives with sharp pointed sticks in the countries where it grows. But unlike coal, there is only a limited supply of this gum left for the world's use, and already this material is so scarce that had not a substitute for this gum in the nature of China wood oil been found in comparatively recent years it is not improbable that varnish would now be so valuable that only the very wealthy could use it.

Transportation costs are high, and the expense of getting it into the country and shipped to various plants is a serious item, even with the use of this alternative material.

John D. Rockefeller, when upon the stand at the time the Standard Oil Company was under investigation by the courts, stated that one reason why oil prices were maintained at the level complained of was because neither he, nor any one else, could tell what morning he would wake up to find the supply of petroleum exhausted. So it is with varnish gums. There is no telling when the end of the visible supply will come. Every day it is harder to find, and the natives who hold the secret of location of these gum mines will not reveal it to those who would purchase it in larger quantities.

This gum comes to manufacturers in 200 pound boxes. When it arrives at the factory it is put into large copper kettles, where it is heated to about 500 degrees to fuse it. Pure linseed oil is then added, according to the grade of finished varnish required, more for outside than for inside varnishes. Turpentine is then added as a vehicle for holding the gum in solution, and dryers are supplemented according to the kind of varnish specified.

Every manufacturer has his own formula for the manufacture of varnish. It is his stock in trade. It is equivalent to a college education because when a father hands his varnish making formula to his son that young man is as fully equipped to go out into the world to make his way as is the young man who spends \$4,000 or \$5,000 on a college education. He is able to command a salary of \$5,000 a year if his formulas are good ones. Expert varnish makers are scarce and for that reason a manufacturer will hold onto a good varnish maker as long as he can.

There have been formulas published, but without actual kettle experience they are worthless. That was the trouble with the varnish used in the suburban home cited. The manufacturer tried to get along without the services of an expert varnish maker with whom he had been associated for a quarter of a century.

The formulas cover, roughly speaking, four grades of varnish: spar, for exterior work; rubbing, interior finish; railroad carriage or automobile, furniture and lithographers' varnishes.

The requirements of varnish are: general wearing qualities; they must be proof against moisture, they must be proof against checking or cracking, they must dry and stay hard; they must have elasticity, that is they must work out well under the brush; they must be pale so as not to hide but rather to bring out the beauty of the woods they are designed to preserve; they must be non-scratchable.

Unlike paints, varnishes are never guaranteed to spread over a certain area per gallon. This is something that cannot be accurately estimated because the character of the surfaces to be covered are varied according to whether the surface is beaded or plain. The manner in which the filler has been applied also has much to do with this point. It is always safe, therefore, to discount the statement of any manufacturer, salesman or dealer who makes unconservative claims regarding the capacity of his varnish to spread.

Few varnishes are guaranteed. Only those manufacturers who have facilities for adequately supervising their batches can afford to back up their varnishes with a guarantee. But in every case the guarantee has the provision that it must be used direct from manufacturer's can or barrel without adulteration by painter.

Failures in varnishes are due to improper manufacture. When a painter thins down his product to make it cover more area, he is applying a varnish in which failure is almost sure to result. Another reason why otherwise good varnishes sometimes go wrong is because the painter has been careless about admitting moisture or permitting the room to become too cool before the varnish dries. Sometimes a painter will have to wash off dirt and stains from wood. If he applies the varnish or the filler before the wood is perfectly dry, he is sure to have trouble.

It is essential that rooms that are being varnished should have a temperature of between 65 and 70 degrees Fahrenheit for perfect results. The same temperature is desirable for exterior work.

Substitutes are sometimes applied by painters. In such cases kerosene or benzine is used. They sometimes will tell the architect or the owner of a building that this does not harm the varnish at all, merely making it dry quicker. As a matter of fact, this adulteration is a producer of larger profit for the painter if he buys the varnish, and such adulterated varnish is sure to check or crack under exposure to the sun or quickly varying temperatures, or it will abraise or bruise easily. The only way left to the architect or the owner or the householder who uses varnish in small quantities is to supply his painter or contractor with whole cans of the brand he wants used and direct him to use it from the original package. It is highly important that this reservation be made a part of the specifications for painting and varnishing so that your instructions will have to be lived up to.

PLUMBING A SCIENCE NOW.

Many Hard Problems Face the Modern Sanitary Engineer.

"The days of the master plumber, as the term master plumber was understood thirty years ago, seem to be passing," said a contractor the other day. "In his place there has arrived the sanitary engineer. The master plumber was the individual who clad in overalls looked at an architects drawing of a five or six story office building and estimated on the construction and the placing of the plumbing. In nine cases out of ten the work was poorly done without due regard to sanitary conditions.

"With the evolution of the office building, as understood in Manhattan to-day, came the evolution of the master plumber into the sanitary engineer. Modern methods of hygiene and an application of sound engineering principles have made possible the modern science of plumbing, and plumbing is a branch of engineering akin in importance to mechanical engineering. So that the sanitary engineer is a type of highly paid, college graduated engineer with various diplomas and other attachments to his name.

"With the enormous buildings in the business districts of large cities it requires as much planning and designing for the plumbing as for the construction of the building itself, and the architect has to work hand in glove with the sanitary engineer to make his building a success. The comprehensiveness of the sanitary engineering business can fully be grasped by following the work of a small army of plumbers on a modern skyscraper. In a new building of fifty-five stories that is now in the course of construction, the sewer, water supply, and drainage systems are not the least important items in the construction of the building.

"All sewer connections in this building have to be carried to the public sewer; the public fixtures above the basement floor have to have a gravity system of drainage and the sub-basement floor a system of drainage to an airtight sewage pump. Then again a system for the discharge of all rain water from the roof, balcony and other exposed parts of the building to the public sewer. Then separate systems for the water drains, ash elevator, steam blowoff, heating, refrigerating, sinks, drinking fountains, kitchen refuse and a thousand and one odd things.

"In addition to the above the plumber has to provide for a separate water supply system, inclusive of flushing systems, water cooling and filtering, jackets for water cooling, vacuum cleaners and boiler feeds, and a system for the gas piping for kitchen cooking and emergency lighting, connections to different pumps and sewage tanks, and also a means of breaking the fall of the water from a height by traps and offsets."

Not the Only One to Paint.

From the St. Louis Post-Dispatch.

Col. Newell has written his reminiscences as an Indian agent and this is one of the stories he tells:

The Indian Commissioner visited the agency one day and asked to have all the Indians brought before him, that he might make them a speech. These were the Brule Sioux, of whom Spotted Tail, one of the most illustrious of Indians, was at that time head chief. In the course of his address the commissioner asked the Indians to quit painting their faces and bodies. He told them that none but a savage painted his face or his body. After he had finished Spotted Tail arose.

"You say we are savages because we paint our faces and bodies," he said. "Last spring I was in Washington and went to the President's Inaugural ball. All the white women at that ball had their faces painted. I do not think we are savages," he said.

The assembled Indians shrieked with laughter.

WE ARE YET NOVICES IN FOREST SAVING

Our Knowledge of the Nature and Needs of Trees Is Still Meagre.

TAKE MORE THAN WE GROW

Three Times as Much Timber as Its Annual Growth Amounts to Leaves the Woods Each Year.

The Bureau of Corporations estimates that there is a total of about 2,800,000,000,000 board feet of standing timber in the country. Of this about 2,200,000,000,000 feet are privately owned, about 530,000,000,000 feet are in the national forests, and about 80,000,000,000 feet are on the unreserved public lands, national parks, State lands and Indian reservations, says the *Engineering News*.

The earliest attack was upon the white pine of the Northeast, the original stand of which is almost entirely cut out. At the present time the two great sources of timber supply, so far as privately owned timber is concerned, are the Pacific Northwest, with 1,013,000,000,000 feet and the Southern pine region, with 634,000,000,000 feet. Moreover, 82 per cent. of the standing timber owned by the United States Government is in the Pacific Northwest, and nearly all of the remainder is in the other States of the Rocky Mountain region.

The yearly growth of wood in our forests does not average more than 12 cubic feet per acre. This gives a total yearly growth of less than 7,000,000,000 cubic feet. That our forests grow very slowly, although the individual trees of many kinds grow fast, is our fault. There are about 200,000,000 acres of mature forest, mainly in the northern Rockies and on the Pacific Coast, in which the yearly growth is balanced by decay.

There are 250,000,000 acres, mostly in the Southern mountains and Southern pine belt, partly cut or burned over, but restocking naturally with young growth; and 100,000,000 acres, chiefly in the Lake States and Southern pine belt, which have been cut or burned over upon which young growth is wholly lacking or too scanty to make merchantable timber.

There is taken from the forest annually, not including loss from fire, 23,000,000,000 cubic feet of wood, or over three times its yearly growth. This large consumption amounts to 230 cubic feet per capita, while Germany uses 37 and France 25 cubic feet. Each year there are used 90,000,000 cords of fire wood, 40,000,000,000 board feet of lumber, more than 1,000,000,000 posts, poles and fence rails, 118,000,000 hewn ties, 1,500,000,000 staves, over 133,000,000 sets of heading, nearly 500,000,000 barrel hoops, 3,000,000 cords of native pulp wood, 165,000,000 cubic feet of round mine timber, and 1,250,000 cords of wood for distillation.

The condition of the world supply of timber makes us already dependent upon what we produce. There is exported out of the country one and a half times as much timber as is brought in, and except for finishing woods (relatively insignficant in quantity) we must rely upon our own resources for the future supply.

The Forest Service estimates the yearly drain on the saw timber of the country at about 50,000,000,000 board feet. Without allowing either for new growth or for any increase in the rate of consumption the total for all the timber in the United States would represent about fifty-five years supply, and that for privately owned timber alone only forty-four years supply.

These conditions affect the railways of the country not only as they are concerned in the production of timber for their own use but from the broader viewpoint of developing the territory traversed by their lines. The destruction of the timber is followed by a rapid decline of the industries utilizing the products of the forest, with a corresponding loss of revenue for the roads serving the region.

Turning our attention to the conservation of the forest, it will be seen that by the introduction of proper forestry methods the annual productivity of the forest can be considerably increased and that the yearly loss from avoidable causes is much greater than it should be.

There are 225,000,000 acres of producing forest in the country. On this area the stand is so open that all the trees could be grown on 145,000,000 acres, which would be producing at the rate of seventy cubic feet per acre annually. By growing only the best species this growth can be increased to eighty cubic feet, an increase of 1,450,000,000 cubic feet.

There is an unutilized area of 80,000,000 acres within our present producing forest. There are 135,000,000 acres of absolute forest land within our virgin or mature forests now unproductive. There are 90,000,000 acres of waste lands which can be made productive by planting, or by fire protection all of these areas can be made to produce eighty cubic feet per acre, or a total of 24,400 million cubic feet. The total increase possible in the productiveness of our forests is therefore 25,850 million cubic feet.

Only 25 per cent. of the yield of our present producing forest is saw timber. It can be made from 50 to 75 per cent. saw timber through the concentration of growth on the best trees by thinning and the holding of the crop until it reaches good size. This would mean an increase, if all our forest land were productive, from 27,000,000,000 board feet to between 54,000,000,000 and 81,000,000,000 board feet per annum.

The enormous loss from fire in our forests every year is a matter of common knowledge. The value of standing timber destroyed each season from this cause has varied from \$25,000,000 to more than \$100,000,000, the direct annual loss in recent years averaging considerable over \$50,000,000. The destruction of young growth, though never included in estimates of fire damage, is a principal item of loss. The natural restocking of burned over lands takes place very slowly or not at all. All experiences go to prove that damage by forest fires is practically preventable. This stage of development has already been reached in Europe. For example, of 7,000,000 acres in Prussia an average of only 1,400 acres, or one-fiftieth of 1 per cent., was burned over each year during the period from 1868 to 1895.

The railways by working with the State forestry officials can accomplish a great deal of good in the way of prevention of fires started by sparks from locomotives. A concerted action on the part of the railways and State officials is desirable, as the forest adjacent to the railway right of way is often left in such a condition after logging operations that it is a difficult matter to prevent fire starting, even when the greatest precaution is observed. Several roads are now working with the State foresters to accomplish this result; notably the Chicago and Northwestern Railway in Wisconsin.

While the chief loss in timber is due to fire, other causes contribute largely to the prodigious waste which has accompanied our use of the forest. In logging 25 per cent. of the standing timber is left or otherwise lost. The boxing of long leaf pine for turpentine has destroyed 20 per cent. of the forests worked. The loss in the mill is from 33 to 66 per cent. of the timber sawed. The loss in the mill product through seasoning and fitting for use is from 14 to 25 per cent. Great damage is done by insects to forests and forest products. An average of only 320 feet of lumber is used for each 1,000 feet which stood in the forest.

Of all the wood in every form now in use in the United States, decay, fire, insect and salt water borers destroy not less than the equivalent of 8,000,000,000 board feet each year. Of these, decay is far the most destructive.

In 1880 the United States census undertook to ascertain what remained of our timber resources. It was found that they had been very rapidly depleted. Realizing the importance of the question the American Society of Civil Engineers appointed a committee to report upon the best methods of preserving wood in order to lengthen its life. This committee was appointed in 1880 and presented its report in 1885. This was followed by the movement which has culminated in the present large wood preservation industry of the country.

In 1910 about 97,500,000 cubic feet of timber was treated. Most of this consisted of cross ties. About 65 per cent. were treated with creosote and the remainder with zinc chloride and zinc creosote.

In the United States the science of forestry is still in the formation stage. Knowledge of the characteristics and requirements of the many species of trees composing the forests is limited; the total amount and distribution of forest wealth is not accurately known and the methods of administration are not yet settled but are subject to frequent change. In Europe, on the contrary, forestry as practised to-day is the result of centuries of gradual evolution and is consequently thoroughly systematized and its methods firmly established. Foreign silvicultural methods are not usually applicable without change, but the general systems have been adapted with success to conditions in this country and should be still more widely used.

A striking point concerning forestry abroad is the important part taken by the State in the management of communal and private as well as of the State forests and the considerably greater returns obtained under State management. All communal forests are subject to some form of State supervision, and many of them are managed precisely as if they were State property.

Private forests necessary for the protection of watersheds or the welfare of the general public are also subject to State control; they cannot be cleared; cutting must be done as prescribed by the State, and all cuttings must be reforested. Other private forests not necessary for protective purposes can usually be managed as the owner desires, but cooperation with the State in the management of such forests is common.

With a few exceptions comparatively little attention has been paid by the railroads to forestry. Tree plantations have been started in a number of cases, some of which have been on a large scale, but for the most part experimentally. Forest planting in some cases may be desirable when a railway has waste land for which it has no particular use. It is a good object lesson to the farmers, and if the plantations are successful they will net a fair return on the investment and furnish a limited supply of ties and timber for the future.

It should be observed, however, that it would not be practicable for the individual roads to plant enough trees to supply their timber requirements, and further the critical period of scarcity and high prices would come before any of the trees so planted would reach maturity.

If the railways wish to provide against future scarcity and excessive prices with any degree of certainty it will be necessary for them to actively engage in forestry operations having for their purpose the management of mature timber lands and the cultivation and reforestation of the cut over lands within the forest area. This is an individual problem with every road, but generally speaking it is the only sound policy which will provide for the future requirements fifteen or twenty years hence.

MONUMENT TO INDIAN BRAVERY.

The "Fool Indian Band" That Rescued White Captives From Savages.

Mobridge correspondence St. Paul Pioneer Press.

The story of the "Fool Indian Band" is unique and has no parallel in the history of this country.

Nearly half a century ago a drama was enacted on the spot where this city now stands. It was in the year of the terrible New Ulm and Mankato massacres in Minnesota in 1862, when all the men fit for service were engaged in the battles of the civil war and only defenceless women and children and men who were unfit to go to the front were left to take care of the homes of the settlers.

In this unprepared state these were an easy prey to the then murderous Indian and hundreds were slain before a force strong enough could be raised to drive the redskins across the Missouri. When they retreated they took with them a party of white women and children, and by forced marches reached this spot.

One cannot appreciate the feelings of these hapless captives as they were hurried across the plains to what was worse than slavery. But something touched the hearts of their younger captors, who, under the leadership of Chief No Heart, decided to get the captives to their homes and to their relatives and friends.

Daring the tortures they knew would be theirs if their undertaking should fail they called their native strategy into play, and eluding the main camp after many hardships and weary days succeeded in returning the captives to their relatives and friends, who had long since given them up for dead.

After forty years Congress recognized the bravery of the band by giving each of the survivors a small medal, and later, after all but two had gone to the happy hunting grounds, the State of South Dakota erected a shaft of red granite with the inscription: "Shetek Captives Rescued Here November, 1862, by the Fool Indian Band." The shaft was erected on June 15, 1909, and is the only historical monument erected by the State of South Dakota.

CONCRETE USED OVER A MINE.

A Foundation Where the Ground Below Contained Coal Workings.

An unusual form of foundation was adopted recently in constructing a high class residence in Pittsburg in a location where the ground was known to contain old coal mine workings at some distance under the surface, says the *Engineering News*. Since a great part of the city is underlaid by such old workings the condition is not an exceptional one, but ordinarily no means for protection against possible future caving of the workings are thought necessary. In this instance, however, the workings were near the surface and the owner preferred to protect himself by carrying the foundations through the workings into sound rock below. The following describes the case in brief:

In preparing for the construction of a residence for O. M. Reif at Beacon street and Shady avenue, in the Squirrel Hill district of Pittsburg, exploratory holes were drilled to determine the extent of undermining by coal workings. The workings were found at depths of 35 to 55 feet below the surface, with shale and sandstone overlying. The workings did not seem to be open and free of débris, indicating that the roof had fallen in the past, and it was considered quite likely that future caving of the roof and possible surface subsidence were to be anticipated. The owner therefore planned to sink concrete columns through the overlying rock and the workings, footing them in the solid rock below, and to support the house on girders carried by these columns. The work was designed and executed in accordance with this plan by the Cummings Structural Concrete Company of Pittsburg.

The front east corner of the house was known to rest over a pillar in the mine and it was thought unnecessary to provide a column at this corner. Six columns were distributed along the other sides. They are directly under the walls and under the middle partition in such arrangement that the lower portions of the walls could by forming them into reenforced concrete girders be made to support the entire structure of the building and transmit the load to the columns.

The columns were formed by first drilling 10 inch and 14 inch holes down to the desired foundation level and then forming a reenforced concrete column in the holes by inserting spiral reenforcement and filling the hole with concrete. The hole was lined by dropping in a galvanized iron tube slightly smaller than the hole, this lining being continued to the surface, the object of this was to make the concrete columns completely independent of the rock and thus permit settlement of the rock without putting additional load on the columns.

The reinforcement in all cases consists of four 1 inch longitudinal rods and spiral hooping with 2 inch spacing of turns. The specifications required the hole to be cleaned thoroughly and the reenforcement to be placed so that the longitudinal rods bore solidly on the rock below. The concrete was placed in 18 inch layers and churned to thorough compactness. Each column was concreted to the top in a single operation. The girders were concreted separately; it was required that the west and middle longitudinal girders and the rear transverse girder should each be concreted in one operation and the small transverse girder under the front edge of the bay was concreted half with each of the adjoining longitudinal girders. On the east side and the east portion of the front wall, where no pile columns were placed, it was not thought necessary to use girders for support, but the lower part of the walls was reinforced for tie purposes.

Knowing How.

From the Shoe and Leather Reporter.

"It pays to 'know how'" declared an Ohio manufacturer. "I quoted a price on some goods the other day to a shoe manufacturer and he told me he could buy the raw materials in those goods for a great deal less. I admitted it and proceeded to tell him this story:

"A hobo sat on a factory fence and watched the factory superintendent sweat and storm because 400 operatives were idle because of a faulty safety valve.

"'I used to work in the plant that makes those valves,' drawled the hobo, 'and I'll fix your valve if you want me to.'

"He did. Again the wheels whirred and the operatives were busily employed and the men in charge relieved. All the 'bo' had done was to cut a little leather washer from his shoe and fit it in the right place. Asked for his charge he answered 'twenty-five dollars.'

"'Twenty-five dollars!' shouted the superintendent, 'why, you haven't made twenty-five dollars in twenty-five months.'

"But the tramp drawled: 'Twenty-five dollars.'

"Finally it reached the treasurer of the company, who humorously asked the tramp to make out a bill. He did and after much labored scrawling and scratching presented it. It read:

The Solon Mfg. Co.,
To John Doe, Dr.

To repairing one safety valve	.75
To knowing how	\$24.25
	\$25.00

"And he got it.

"Also I got my order from my friend, the shoe manufacturer."